

LA-UR-18-23524

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Title: NanoCluster Beacons: A Spotlight on DNA Targets

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Intended for: Report

Issued: 2018-10-15 (rev.1)

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NanoCluster Beacons: A Spotlight on DNA Targets

Next-Generation Smart Sensors for Rapid Detection of Pathogenic DNA Sequences

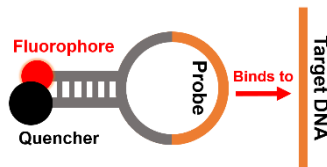
BACKGROUND & MOTIVATION

Rapid detection of DNA is crucial for

- Disease diagnosis
- Pathogen identification
- Gene therapy
- Forensic applications

Drawbacks of current commercial DNA sensors (e.g. molecular beacons)

- High costs
- Low sensitivity
- Slow binding kinetics



INNOVATION

Rapid detection of DNA with high specificity and sensitivity

- Silver nanoclusters, containing only a few silver atoms, are designed as the NanoCluster Beacon
- Once the dark NanoCluster Beacon binds in proximity to a DNA enhancer sequence, it lights up and emits more than 500-fold stronger fluorescence

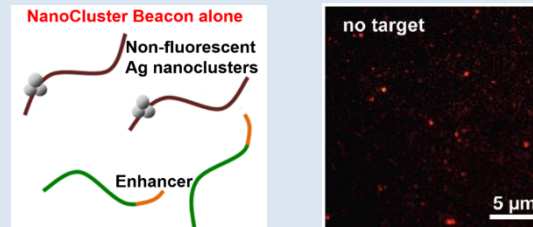


- Simple design, cost effective, rapid detection rate, and easy to use

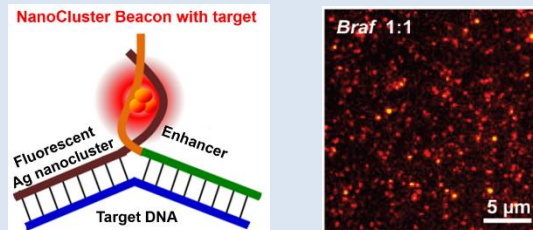
DESCRIPTION

NanoCluster Beacons as the next-generation smart sensors for detecting pathogenic DNA targets.

- NanoCluster Beacon consists of two components, one DNA bearing a non-fluorescent silver nanocluster and the other DNA bearing an enhancer sequence. Without target DNA, NanoCluster Beacon itself remains dark



- When the target DNA, such as human *Braf* oncogene (cancer DNA) is present, the two components of NanoCluster Beacon bind in juxtaposition to the target sequence, which allows the enhancer to be in close proximity to silver nanocluster and light up the NanoCluster Beacon



- A rainbow of emission colors is available for NanoCluster Beacons, which is highly desirable for multiplexed analysis



Current Technology Readiness Level (TRL) 3/4

Six disease-related DNA sequences and DNA amplified directly from clinical samples have been successfully tested

ANTICIPATED IMPACT

Rapid and sensitive detection of specific nucleic acid targets (e.g. DNA and RNA) at the point-of-care and field-based settings is the “Holy Grail” for diagnosis

- Inexpensive
- Straightforward
- Amenable to existing technologies
- Versatile for a variety of applications



PATH FORWARD

Clinical Applications:

- Biosensors development for specific pathogenic DNA sequences
- Infrared red and near infrared imaging agents development
- Multicolor assay for simultaneous detection of multiple DNA targets

Technology Transition:

- Converting the solution based NanoCluster Beacons into commercial assay kits and ultimately portable devices or dip-stick assay for field-based diagnostics

Potential End Users:

- Biomedical companies, clinical research labs, and hospitals

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